STONE QUARRY SCANNING TECHNIQUES USING DR TOTAL STATIONS

GIS open

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LEGAL BASIS

- In Romania, mining activities are governed by laws and reglementations. The law governing activities in the mining domain is the Law of the Mines (Law no. 85/2003), and the topographical activity in mining is reglemented by the Mining Topography Reglementation.

- The main beneficiaries of the collected information are:
  - NAMR (National Agency for Mineral Resources – or ANRM in Romanian)
  - NACREP and OCREP (National Agency of Cadastre and Real Estate Publicity and territorial Offices of Cadastre and Real Estate Publicity – or ANCPI and OCPI in Romanian)
  - National Agency for Protecting the Environment
  - town halls
  - other institutions

APPLIED TECHNIQUE

* The basis for this work is the scanning of the working front through laser tracker (step by step) and processing these information with adequate programmes. The scanned objective is the Urviş stone quarry in Bihor county, Romania.

* The comparative calculations are the result of the necessity to make two measurements over the same entity or to distinguish a result by two different calculation methods.

The scanning of the working front represents a series of advantages:

- reduced work time
- when using the Total Station-GPS technology and stationing bases which were anterior detemined, the problem of the classical positioning dissapeares
- for volume calculations, only the excavated zones are used
- reduced time span for obtaining the results
- relevation of the zones in the snag

TECHNOLOGY USED

- For data acquisition we used the Trimble S6 Total Station.

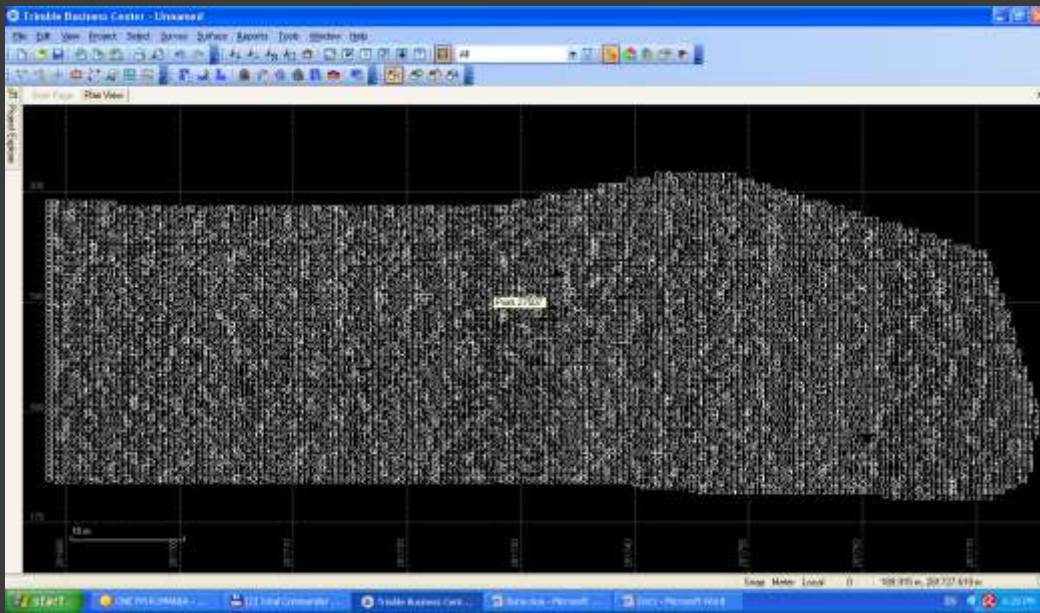|		Trimble S6
selection of scanned surface		polygonal, rectangle, specify 3 points, through the telescope
angle accuracy		5 " (1.5 mgon)
distance accuracy	Standard	(3 mm + 2 ppm)
	Tracking	(10 mm + 2 ppm)
scanning speed	Standard	1 point / 1 - 5 sec.
	Tracking	1 point / 0.4 sec
min. dist. between pts.		10 mm

- This total station has the possibility to measure points in reflectorless mode up to 150-200 meters on hard rock surface. Also, the total station has a large amount of memory at it's disposal to record all the data from the field.

- The scanning process was realized using steps between 0,5 – 1 meters (due to the large surface and the lack of important details) and manual observations were added in the zones of higher importance.

- The points resulted from the scanning process were imported and processed in the Trimble Business Center software, which gives us the possibility to create the 3D model of the scanned area from the point cloud obtained after the scanning. Besides this, the software allows us to overlay different models created after different scanning sessions in order to calculate the excavated volume.

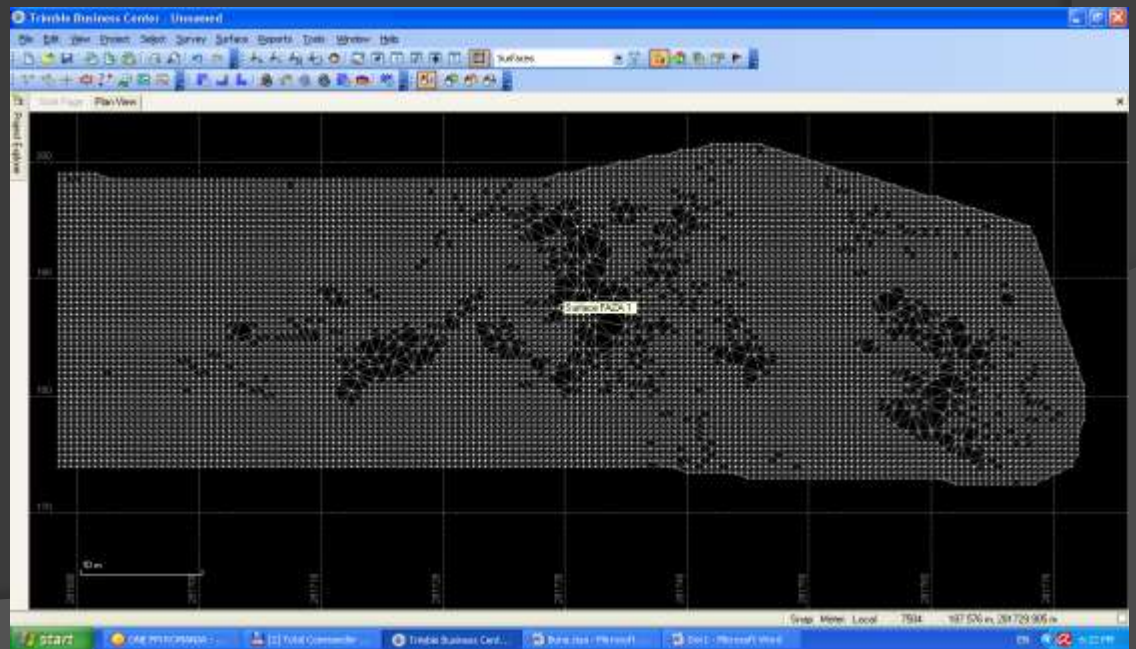# LET THE PICTURES TALK...

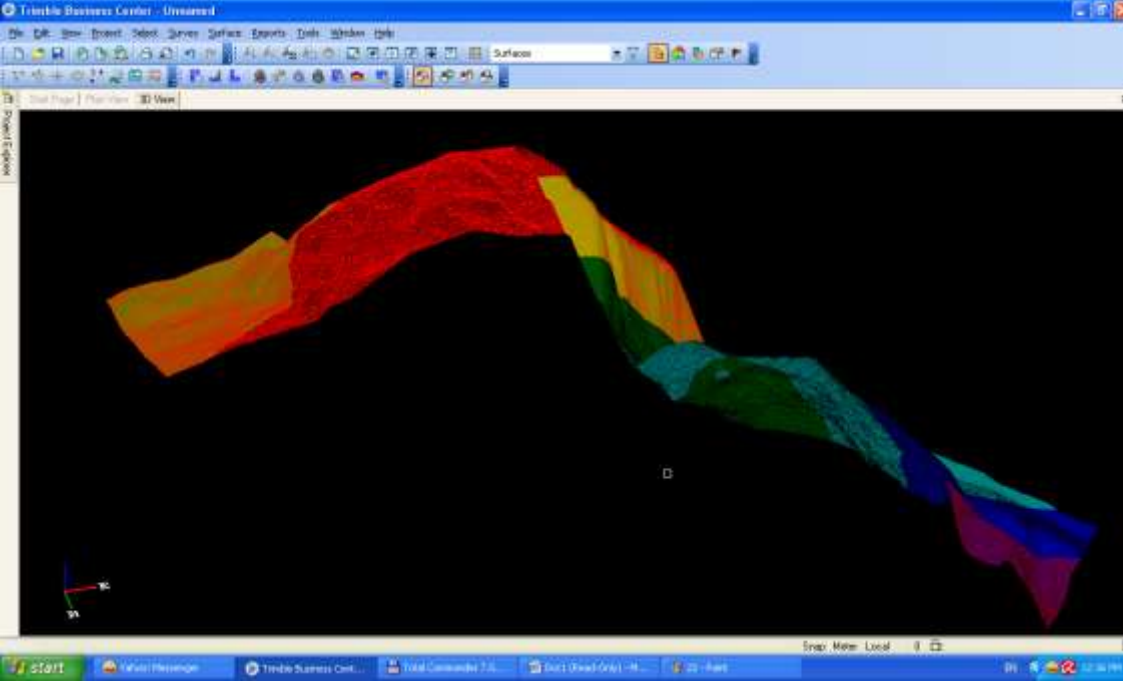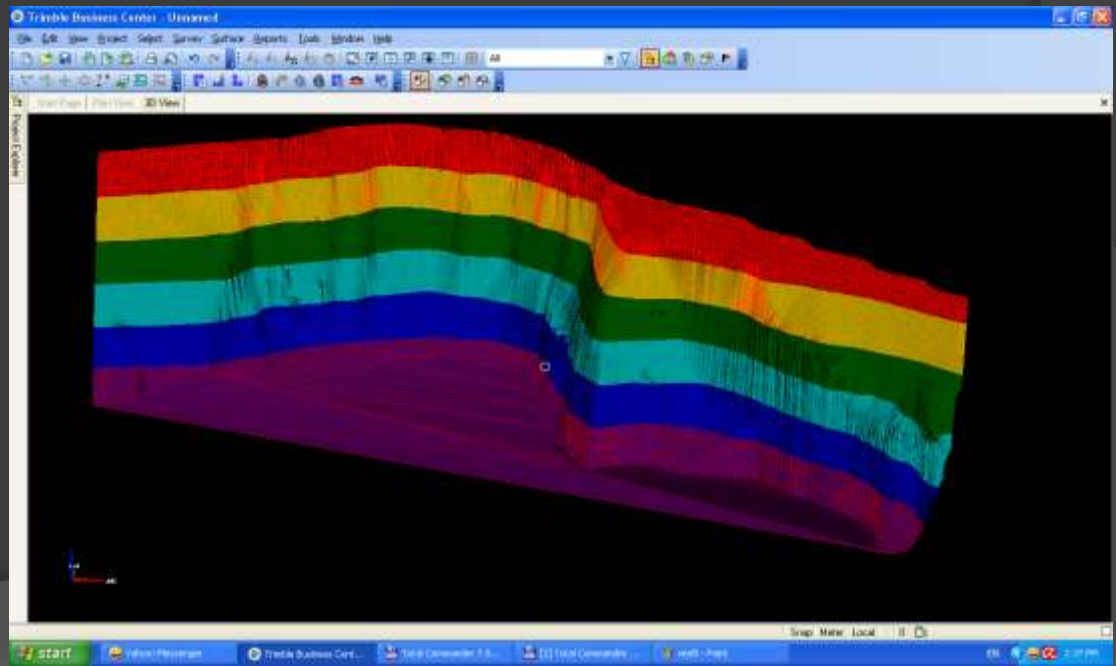
Work area – Urviş stone quarry, Bihor county, Romania

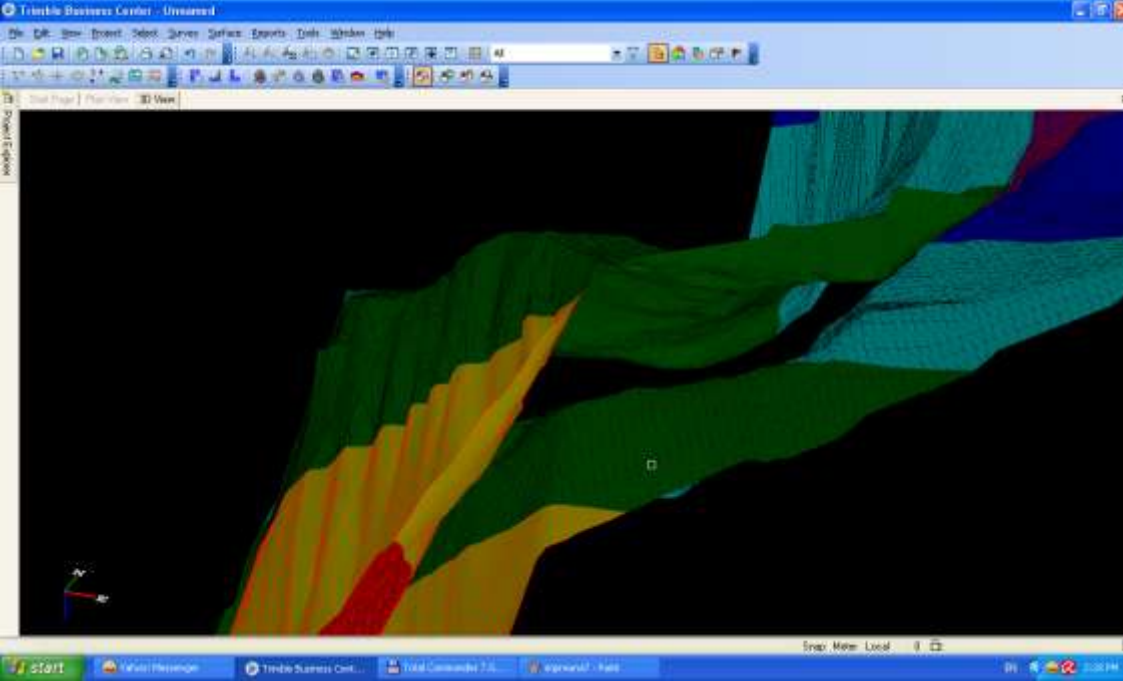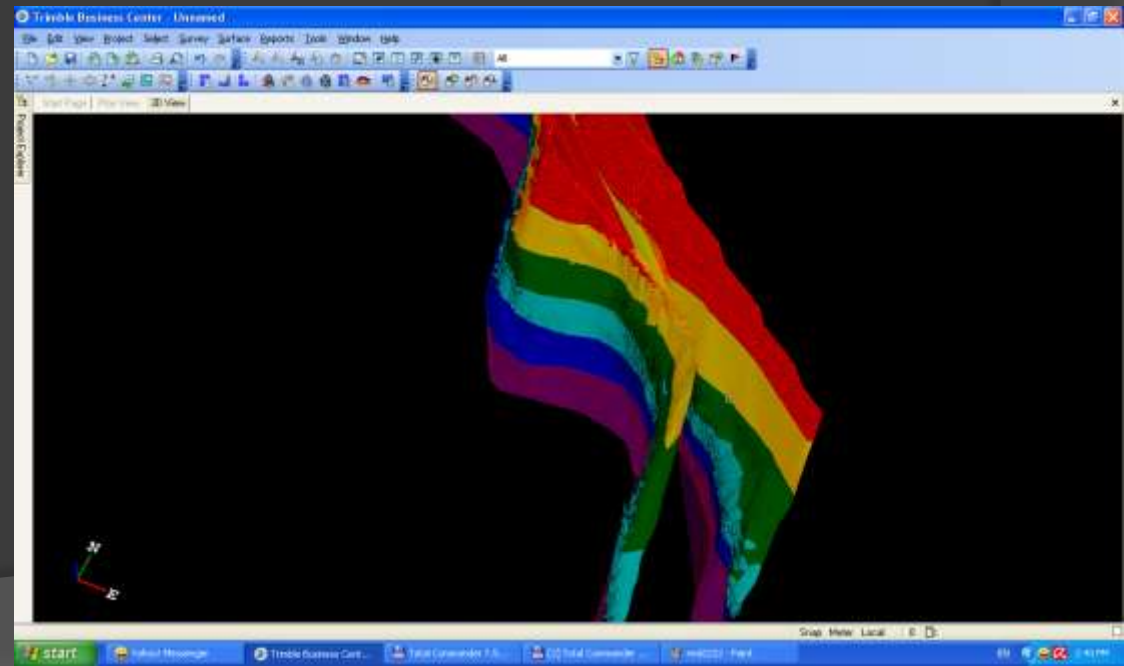Data processing steps after the first scan, before the blast

Color coded 3D models, still before the blast

Overlayed 3D models resulted from two different scanning sessions (second one after the blast)

CONCLUSIONS:

- The presented technique makes for easier data acquisition on the field and resolves some problems which appear during the calculation of excavated volumes. The reality on the field leads to the apparition of new problems, which needs solutions based on the actual technology.

- The step by step scanning technique represents a solution with applicability in the case of the small and mid-sized quarries. The used apparatus can be considered classical if we have in mind that scanning operations can be made with any total station equipped with servo direction and reflectorless distance measurement capability up to the distance of 200 – 300 meters.

- In conclusion, we can better approximate the excavated volumes, which will enhance the quarry's material and economical efficiency.

Thank You
for your kind attention